

# Laser tonsillectomy as a treatment on chronic tonsillitis: a case report

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## ABSTRACT

Tonsillectomy is one of the most often conducted surgical procedures in children. It has several surgical techniques, such as tonsillectomy with thermal welding, guillotine excision, electrocautery, cryosurgery, coblation, ultrasonic removal, laser removal, monopolar and bipolar surgery, and tonsillectomy with ligatures. This case report aims to present a detailed description of a 9-year-old boy who is suffering from tonsillitis. The patient came to the Ear, Nose, and Throat (ENT) clinic with a chronic history of reoccurring throat pain over the past two years, which has lately intensified over the past six months. Complaints are experienced nearly monthly, occasionally accompanied by pain while swallowing, coughing, and a runny nose. The patient experiences a laser-assisted surgical procedure to remove the tonsils. We performed a surgical procedure to excise the tonsil mass using a gallium aluminum arsenide (GaAlAs) diode laser with a wavelength of 980nm/1470nm and a power of 4 watts. This procedure was successfully performed. After laser tonsillectomy treatment on days 1-3, the Visual Analog Scale (VAS) score was 1, indicating no bleeding. On the fourth day, the patient had no pain or bleeding.

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## INTRODUCTION

Estimates of the worldwide prevalence of chronic tonsillitis, often known as the tonsil chronic inflammatory process, range from 5% to 12% (Costa et al., 2022). One of the most popular surgical operations globally is tonsillectomy, the second most common ambulatory surgical intervention in children (Tsikopoulos et al., 2023). A tonsillectomy is a typical treatment in which the palatine tonsils are removed entirely or partially (Albazeer et al., 2022). There are several reasons for tonsillectomy, but the most common ones include recurrent peritonsillar abscesses, frequent throat infections, and obstructive symptoms (Randall, 2020). The removal of tonsils as a medical surgery

has a long history, dating back to the first century AD. It is accomplished by various procedures and devices that have developed throughout time (Al-Shehri et al., 2020; Russo et al., 2024).

Numerous novel tonsillectomy procedures have been made possible by recent technological developments in equipment. This procedure is carried out using a variety of surgical procedures, such as thermal welding tonsillectomy, guillotine excision, electrocautery, cryosurgery, coblation, ultrasonic removal, laser removal, monopolar and bipolar dissection, and tonsillectomy by ligature (Al-Shehri et al., 2020; Bashir & Swami, 2023). Even though tonsillectomy is a commonly used and successful technique, patients still run the risk of experiencing side effects, including discomfort and bleeding (Aldamluji et al., 2021; Odhagen et al., 2023; Postier et al., 2020; Qian et al., 2020).

Before advanced techniques, the conventional technique, sometimes called the "cold" or traditional technique, was regarded as the "gold standard" for tonsillectomy. Hemostasis is achieved by employing ligatures, sutures, or monopolar/bipolar diathermy. Simultaneously, cryogenic instruments extract the palatine tonsil and its capsule from the tonsillar fossa. Due to the lower postoperative bleeding rate, many doctors consider it a safe method (Tsikopoulos et al., 2023). Each technique has its advantages and disadvantages. Surgical time, blood loss, bleeding after surgery, and especially postoperative morbidity should all be reduced with the improvement of these processes. Surgical methods that are quick and require little recovery time are preferred as the demand increases in daily cases. Ideally, surgery is painless and allows patients to return to their activities more quickly (Al-Shehri et al., 2020).

Different techniques and various kinds of laser equipment have been used in place of conventional cold scalpel surgery (Costa et al., 2022). Specifically, tonsillectomy saw several changes from the early 1980s when laser-assisted surgery was first offered in otorhinolaryngology. Laser tonsillectomy is linked to reduced surgical time, discomfort following surgery, and intraoperative blood loss (Tsikopoulos et al., 2023). Several lasers, including CO<sub>2</sub>, KTP, NDYAG, and diode, have been utilized in tonsillectomy procedures (Alaqeedy et al., 2022; Amsriza & Fakhriani, 2024; Jain et al., 2022).

Diode lasers have the benefit of having sound thermal effects on perifocal tissues and short penetration depths, meaning they seldom cause adverse effects on deep tissues. Because of its outstanding results and low postoperative problems, it is particularly beneficial in the tonsillectomy procedure (Alaqeedy et al., 2022). Hence, this case report aims to describe the presentation, examination findings, and treatment provided to a 9-year-old boy who was diagnosed with tonsillitis.

## RESEARCH METHOD

This type of research is a case study. The respondent of this case is a 9-year-old boy who came to the ENT clinic of a hospital in Yogyakarta. The collection of data was conducted through both primary and secondary methods. The primary approach for collecting data is direct observation, and secondary data is acquired from journal articles and books. After data collection, the authors organized and systematically wrote the material.

## RESULTS AND DISCUSSIONS

A 9-year-old boy visited the Ear, Nose, and Throat (ENT) clinic with a history of recurring throat pain for the past two years, which has recently become more severe during the previous six months. Complaints are experienced nearly monthly, occasionally accompanied by pain while swallowing, coughing, and a runny nose. Upon physical examination, the oropharynx displayed T3-T3 tonsils, dilated crypts, and no residue. The ear and nose checks showed no abnormalities. The individual underwent a laser-assisted surgical procedure to remove the tonsils.

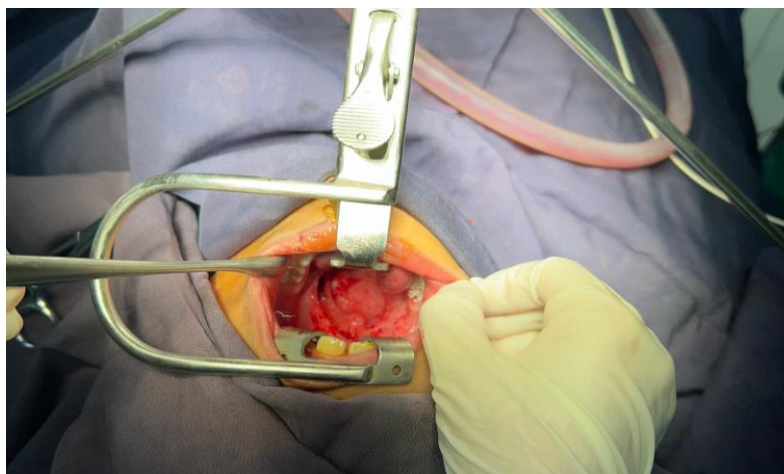
The patient experiences a laser-assisted surgical procedure to remove the tonsils. After the patient is anesthetized, the surgical site is disinfected. The area around the surgery is covered with a sterile towel. Then, the Davis-Boyle Mouth Gag was installed, and from the results, we found tonsils on the left side; then, we moved the tonsil mass towards the medial using an allice clamp. We performed a surgical procedure to excise the tonsil mass using a gallium aluminum arsenide (GaAlAs) diode laser with a wavelength of 980nm/1470nm and a power of 4 watts. Excision was performed from the superior to the inferior pole until the tonsil mass was removed. No bleeding was detected during the procedure. A similar procedure was also performed on the right tonsil. This procedure was successfully performed. After laser tonsillectomy treatment on days 1-3, the Visual Analog Scale (VAS) score was 1, indicating no bleeding. On the fourth day, the patient had no pain or bleeding.



**Figure 1.** Before laser tonsillectomy



**Figure 2.** Incision of tonsil mass by delivering a gallium aluminum arsenide diode laser (980nm/1470nm)



**Figure 3.** After laser tonsillectomy

Despite being a standard surgical procedure performed by otolaryngologists using various techniques, tonsillectomy still has potential risks, such as postoperative bleeding and discomfort. The harmonic ultrasonic scalpel and the collator have become increasingly popular in surgical disciplines due to the previously mentioned theory that lower temperatures reduce postoperative discomfort (Alaqeedy et al., 2022). The laser's cutting and coagulating powers stem from the tissue's absorption of laser energy, which is then transformed into heat. Tissue chromophores, including hemoglobin and water, control how much laser energy is absorbed (Jung et al., 2021).

In this case, the patient underwent the gallium aluminum arsenide (GaAlAs) diode laser (980nm/1470nm) tonsillectomy. This technique uses a flexible optic fiber to transfer contact diode laser energy. After that, this tool is utilized like a scalpel to cut out and remove the targeted tissues and any related veins (Al-Shehri et al., 2020). This study showed that diode lasers had good intraoperative performance and postoperative results. This device operated for a brief period and demonstrated a reasonable cutting capacity.

Though the application of lasers has been more commonplace recently, the first documented clinical experience with a laser tonsillectomy dates back to 1972 (Kumar et al., 2022; Santhraya & Pavithran, 2021). Many laser types, including diode lasers, KTP, ND YAG, and CO<sub>2</sub>, were employed for tonsillectomy, each with unique physical characteristics. The physical properties of a diode laser are comparable to those of a Nd-yag laser. However, it is preferable due to its reduced heat effect on collateral structures (Jones et al., 2018). Due to its red-hot cautery effect, the diode laser's cutting or vaporizing action can be done with extreme delicacy and minimal lateral damage. This makes it an excellent tool for tonsillectomy (Maloney, 1991).

Numerous investigations on the relationship between histology and lasers have shown that wounds created by lasers behave differently from those created by scalpels in that the surrounding tissue sustains less damage (Kang et al., 2016; Palaia et al., 2020). Furthermore, there is less of an early inflammatory response and fewer myofibroblasts in the wound during the healing process, resulting in less contraction, scarring, and discomfort (Younesi et al., 2024). The 980nm/1470nm dual-wavelength fiber laser can provide 1470nm and 980 nm laser synchronously with different powers (Tang et al., 2018). The 1470-nm laser's water absorption rate is 40 times greater than that of the 980-nm laser, and it has a more robust tissue absorption rate and a shallower penetration depth, which can cause an extremely rapid cutting effect. The 980-nm laser has an amplitude positioned at the golden section point of the absorption curve for water and hemoglobin. This laser exhibits a hemostatic effect and possesses a specialized cutting function.

Thus, during surgery, spontaneous cutting and coordination with contact or noncontact cutting mode can be achieved by integrating the functions of the two lasers (Tarhan et al., 2014).

Based on a systematic review of randomized controlled trials that compare laser tonsillectomy and laser tonsillotomy with other established tonsillectomy and tonsillotomy techniques, laser techniques were found to be either equal to or better than other techniques in reducing intraoperative time in 77% of trials, reducing intraoperative bleeding in 86% of trials, reducing postoperative pain in 64% of trials, and reducing postoperative bleeding in 92% of trials (Ahmed & Arya, 2021).

## CONCLUSION

A 9-year-old boy presented to the ENT clinic diagnosed with chronic tonsillitis and had received gallium aluminum arsenide (GaAlAs) diode laser tonsillectomy. After the laser tonsillectomy procedure on days 1-3, VAS was 1, no bleeding was found. After day four, the patient felt no pain and no bleeding. The use of a single case sample limits this study. To conquer these limitations, future research must prioritize implementing multi-center studies encompassing larger populations. Moreover, it is recommended to include a comparison investigation of different patients to improve the depth of the findings.

Diode lasers utilize semiconductors as the emission source, requiring an in-depth understanding of the laser system's working, the necessary procedures, the precautions to be noticed, and the troubleshooting measures. The utilization of gallium aluminum arsenide (GaAlAs) diode in laser tonsillectomy has demonstrated significant efficacy due to the simultaneous occurrence of separation and coagulation processes, enabling fast hemostasis with minimum bleeding. Diode lasers specifically target soft tissue. Therefore, the healing process is rapid, and the possibility of infection is diminished. Postoperative complications are minimal, and suturing is unnecessary. So, we recommend this method for upcoming tonsillectomies.

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